Překlenout propast mezi analogovými dějinami filmu a digitální technologií. Rozhovor s Barbarou Flueckigerovou

Batistová, Anna ; Flückiger, Barbara

Anna Batistová

Bridging the Gap Between Analog History of Film and Digital Technologies

An Interview with Barbara Flueckiger

Before becoming a scholar, Barbara Flueckiger worked as location sound engineer and sound designer, during which time she created more than 30 soundtracks for international feature films. She studied German literature, film theory, philosophy and media studies at the University of Zurich and the Free University in Berlin. Later she was a consulting scholar with the Swiss Foundation FOCAL, where she organized seminars for film professionals and designed a bibliographical database for books on film and multimedia technology. Afterwards she was employed as Assistant Professor at the Institute of Media Studies, University of Basel and as visiting lecturer at Filmakademie Baden-Wuerttemberg in Ludwigsburg, at the University St. Gallen, University of Zurich, at the Zurich University of the Arts and other academic institutions in Germany and Switzerland. Her Habilitation was accepted at the Free University in Berlin. Since 2007 she is professor at the Department of Film Studies, University of Zurich.

Since the beginning of the millennium, Barbara Flueckiger's research projects have been focused on digitization and digital cinema: AFRESA on digitization of archival films (2008–2011), Film-History Re-Mastered (since 2011), Analog vs. Digital. The Emotional Impact of Film Recording Processes on the Audience (since 2013), DIASTOR. Bridging the Gap Between Analog Film History and Digital Technology (since 2013). In 2015, she received the European Research Council Advanced Grant for a five-year project on color in cinema. She is the author of *Sound Design. Die virtuelle Klangwelt des Films* (Marburg: Schueren 2001) — widely regarded as the standard text book on the topic in German language, and since then printed in 5 edition — and Visual Effects ((Marburg: Schueren 2008). She regularly publishes in German and international academic periodicals. Her *Timeline of Historical Film Colors* (http://www.zauberklang.ch/filmcolors/) is becoming the richest resource for study of color in cinema.

Barbara Flueckiger's web page: http://www.zauberklang.ch/. Her color research blog: http://filmcolors.org/.

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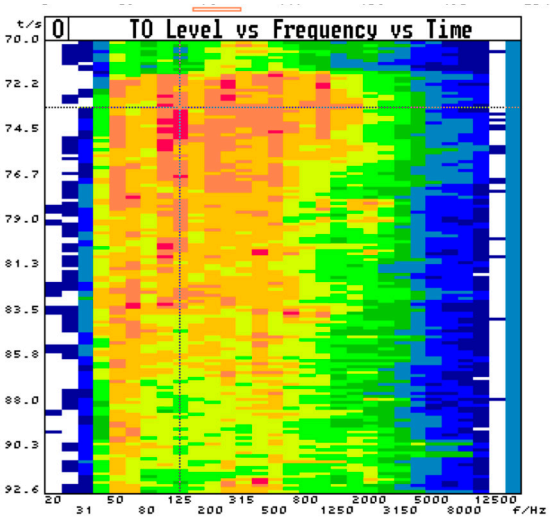
What did your career as a film professional give to your academic career?

My background in film production and engineering proves to be very valuable because it enables me to understand technical concepts and innovations much more easily. This understanding, in turn, facilitates a deep investigation of technologies, their underlying epistemological assumptions and their influence on aesthetic production. During my research — from my PhD to the later projects — I have developed a unique approach based on these insights. I call this approach "technobole" with reference to a concept established by Frank Beau.[1)] While this approach is used to investigate very closely technological developments, its ultimate aim is surpassing the focus on technology by transferring the insights gained to other fields, such as aesthetics and narration, but also by including the cultural roots of technical innovations. In contrast to technical determinism, my approach assumes a feedback loop between culture and technology.

The connection between film technology and aesthetics seems to be an important topic in your research. Could you elaborate on that?

In all of my main areas of research I've been working on, I was able to detect previously hidden patterns that inform the connection between technology and aesthetics. In sound technology and sound design, which were the topic of my PhD thesis, a significant aesthetic change occurred in the mid-1970s. This change was much more influenced by the cultural context than previously assumed — European art cinema, rock music, consumer culture and media consumption in general — but the change in aesthetics required also technical advancements.[2)]



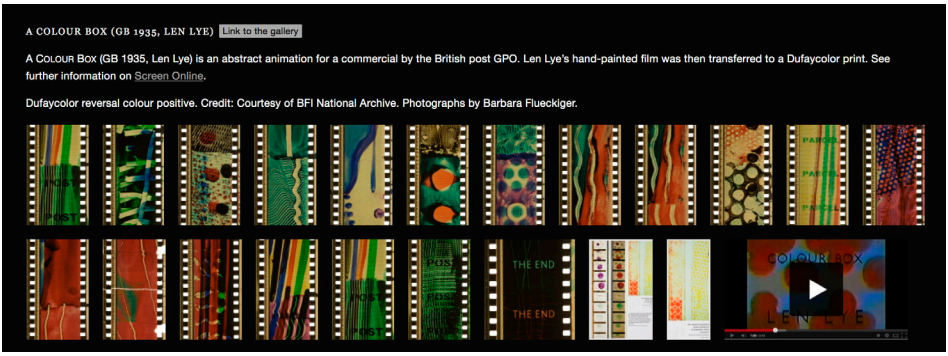
Video RumbleFish on YouTube: https://youtu.be/uU5OCp1Ljn0
Rumble Fish (USA 1983, Francis Ford Coppola) made extensive use of the low frequency range and of new forms of reverberation to evoke an uncanny sense of disorientation. Sound design by Richard Beggs. Measurements show the frequency distribution.

1) See e.g. Frank Beau, La solitude du technobole. Puissance politique des effets spéciaux. *CinemAction*, 2002, No. 102, pp. 196–206.
2) Barbara Flueckiger, *Sound Design – Die virtuelle Klangwelt des Films.* Marburg: Schueren Verlag GmbH 2001. English annotation available online: <http://www.zauberklang.ch/sounddesign.engl.html>, [accessed 10 July 2015].

A similarly complex web of mutual influences between technology, culture, and aesthetics became obvious in my research project on computer generated imagery and visual effects. Not only does CGI provide completely new modes of representation, but it also offers a wide array of new stylistic and narrative means. However, it is interesting to trace back these changes to the invention of binary code in the 17th century. The physical and computational principles underlying these new forms of representation are very challenging to understand, but also very rewarding with respect to the hidden connections between aesthetics and technology. Just think of digital characters and the many obstacles which had to be overcome in order to create convincing bodily and facial expressions.[3)]

Computer-generated version of Marla from *Fight Club* (USA 1999, David Fincher)

For the last seven years I've been investigating the digitization and restoration of archival films with an emphasis on film colors. Again, this research requires a deep technical understanding, both with regard to the chemical and physical



Len Lye's film *A Colour Box* (GB 1935) in Dufaycolor

properties of colors in the many different technical solutions that were invented since the early days of film history, but also with regard to the translation of these properties into the digital domain.

When I look at your past research projects, it seems to me like you are ahead of our time, looking into topics before anyone else does. Why would you say this happens? How do you choose your research topics?

Actually there is a lot of chance involved. Starting from sound design, I acquired basic insights into the relationship between technology and aesthetics. Soon after I completed

3) Barbara Flueckiger, *Visual Effects: Filmbilder aus dem Computer.* Marburg: Schueren Verlag GmbH 2008. English annotation: <http://www.zauberklang.ch/vfx_en_css.html >, [accessed 10 July 2015].

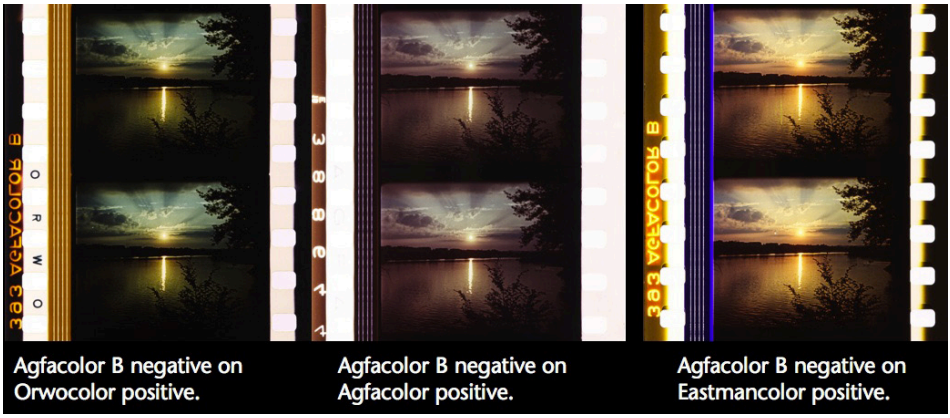
my PhD I was hired as a senior researcher in the first project that investigated the new professional digital HD cinematography as early as in 2000.[4] It was my task to set up an approach investigating the influence of this new technology on filmmaking by studying an exemplary professional film production executed in this digital format. We closely collaborated with filmmakers and the industry. Sony Overseas SA and a film lab in Switzerland were our partners and we worked with the Imaging and Media Lab[5] at the University of Basel. During this project I learned all the basics of digital image processing. As a result I was very unhappy with the way media studies investigated digital imagery. Most of the early studies focused on ethical problems of forgery in digital image processing, while they completely neglected the aesthetics and the general influence of these technologies on filmmaking. Out of this frustration came my desire to do the opposite. I studied hundreds of technical papers and several hundred films that made use of CGI and VFX to track down the possibilities of the new technology.

The first Swiss production in digital high definition, *Little Girl Blue* (CH/ GER 2003, Anna Luif)

Again, by chance, I was associated to a project on the digitization of archival film — AFRESA — because the main applicants of the project from the University of Basel needed the support of film studies to cover the historical questions about film in addition to their approach in hardware and software development.[6] During this project I discovered that in the film studies community there was an almost complete lack of awareness of the huge influence digital technologies were having on our perception of film history. DVDs presented so-called classics in "re-mastered" versions, with "improved" or "enhanced" image and sound, without ever declaring what their sources were and how they were processed. Together with my collaborator in AFRESA, Dr. Franziska Heller, I elaborated the

4) Project description online: <http://www.zauberklang.ch/digicin.pdf>, [accessed 10 July 2015].
5) The lab is called Digital Humanities Lab today, online: <http://www.dhlab.unibas.ch/>, [accessed 10 July 2015].
6) English annotation of the project: <http://www.research-projects.uzh.ch/p10747.htm>, [accessed 10 July 2015].

research project "Film History Re-mastered",[7] supported by a grant from the Swiss National Science Foundation, who had already supported my research on sound design and on VFX. In AFRESA I became aware that the processing of historical film colors by digital means was a serious issue. Therefore historical film colors became one of my core research topics in "Film History Re-mastered". I was able to spend several months at Harvard University to do basic research on the huge variety of color processes that emerged in the course of film history. While Harvard University offered an excellent library and helped me to track down even the most remote technical journals from the 19th or early 20th century, it occurred to me that there are many resources available on the topic, but that they were never organized in an accessible and systematic manner. Therefore I developed the *Timeline of Historical Film Colors*[8] to create a globally accessible resource for researchers, archivists, film historians, restorers, students and interested laypersons. Thanks to my basic knowledge in web programming I was able to create the first version almost completely by myself and with very limited financial means.



Agfacolor B negative on different positive stocks. Credit: Národní filmový archiv / National Film Archive, Prague. Film: *Tábor* (Oldřich Mirad, Czechoslovakia 1953). Photographs by Barbara Flueckiger.

At the same time I also noticed that film labs and facilities which were knowledgeable in film processing were endangered everywhere in the world. Many of them vanished and went bankrupt— Kodak went into bankruptcy, camera manufacturers stopped producing analog cameras. I turned to political authorities in Switzerland to raise awareness for this loss and to ask for support to maintain at least one film lab in operation in Switzerland. However I was faced with the discovery that the political decision makers were not able to react as fast as necessary. Therefore I applied for funding with the Swiss Commission for Technology CTI, a funding agency that supports the collaboration of academic research with the private sector. Fortunately, Disney Research Zurich became my partner, along with the last film lab, Cinegrell Postproduction, film archives — the Cinémathèque suisse and SRF Swiss Radio and Television — and soft- and hardware companies. The overarch-

7) English annotation of the project: <http://www.research-projects.uzh.ch/p15584.htm>, [accessed 10 July 2015].
8) Online: <http://zauberklang.ch/filmcolors>, [accessed 10 July 2015].

ing aim of this project, called DIASTOR,[9] was to keep knowledge in film processing alive while at the same time building up new knowledge on the digitization and restoration of analog films.

Very recently, I received the top European research award — an "Advanced Grant" from the European Research Council — for further research on the relationship of technology and aesthetics of film colors.[10] There are so many questions still open for which we need an extended interdisciplinary project. In this project I plan to develop a web-based tool for the analysis of film colors. The grant will allow me to build up an interdisciplinary research team to excavate hitherto hidden patterns in the evolution of film color technology and aesthetics with the aim to apply these insights to the digitization and restoration of historical film colors.

In summary, I would say that one research topic led to the next one. Every project posed unresolved problems which needed further investigation. From early on in my professional career in film production I was always keen to test new advancements. I think that this willingness to experiment and my very profound curiosity are the most important sources for the evolution of my research topics. When I received the "Advanced Grant" someone asked me why I receive so many grants. I replied that I just have an idea and then I work day and night to put it into practice. A colleague of mine jokingly called this the "tried and true Flueckiger method". It is probably not so obvious that the development, application and execution of such huge research projects is a very time consuming and demanding task.

On many of your projects, you have worked together with individuals from the industry or private research organizations. What is your experience with this? Would you say things are done differently? Do you find such collaboration crucial for your projects?

By definition, all the projects funded by the CTI require the collaboration with the industry. At least half of the financial means have to be contributed by the companies, while the CTI provides the financial support for the scientific research team. Therefore, this type of research is application-oriented with an economic dimension: "Science to Market" is the tagline of CTI projects. The research projects need to provide a quantitatively-measurable economic benefit of the research. In practice, this proves to be a severe challenge, especially when these projects have a duration of 1.5 to 2 years. It is very hard to come up with innovative solutions that deliver an immediate return on investment. While big companies have their own research and development departments, this is not the case with the smaller companies who were our partners in these projects, except of course for Disney Research Zurich, which specializes in scientific research. For smaller companies this poses a real issue. In DIASTOR we faced many challenges with our industrial partners. It required constant exchange of ideas and of goals to understand each other's interests and goals. However, some problems could not be resolved fast enough and one partner left the

9) See the project's website: <http://www.diastor.ch> and its English annotation: <http://www.research-projects.uzh.ch/p18079.htm>, [accessed 10 July 2015].

10) See press release of the University of Zurich: <http://www.mediadesk.uzh.ch/articles/2015/advanced-grants_en.html> and abstract on the Research Database of the University of Zurich: <http://www.research-projects.uzh.ch/p18079.htm>, [accessed 10 July 2015].

project after one year. But now, after two years, we are very happy with the results. The last remaining film lab, Cinegrell Postproduction, is still in operation and they have made huge progress in the field of digitization and restoration. They have also been very generous in providing the academic research team with access to their technical infrastructure and the staff was very interested and helpful. Also we had a very good collaboration with the team from Swiss television, and an increasingly good relationship with the restoration team at the Cinémathèque suisse.

So at the end these kinds of collaboration can be very satisfying, because everyone can benefit from the partners' area of expertise if they are open enough to make this happen. These projects provide a very steep learning curve to me. As the project leader I have to understand everyone's problems and goals as fast as possible.

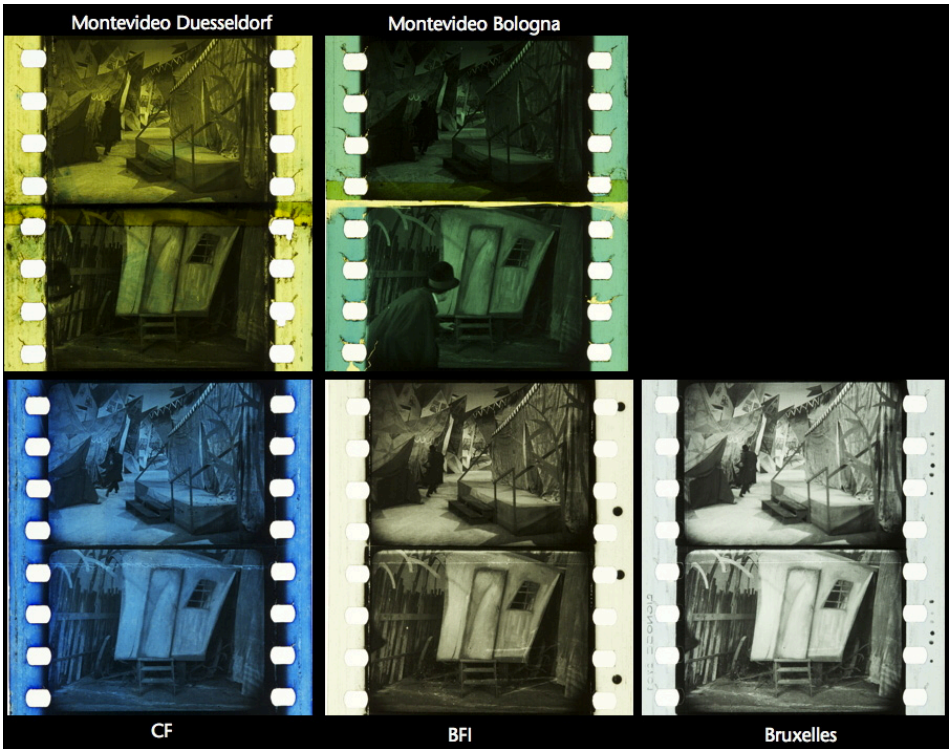
Showreel of the Swiss research project DIASTOR
Video: DIASTOR Showreel: https://www.youtube.com/watch?v=htxq9GPZphM

On an operational level, these projects are also very demanding. In fact leading such a huge project with so many partners usually would be a job of its own, and I have to do this work on top of my professorship with teaching obligations, publications, presentations, supervision of theses etc. As a result I have a huge workload. It is worthwhile because it requires this kind of interdisciplinary thinking "out of the box" to open up new horizons.

How about working with film (or media) archives? For example, for your research on film colors, you are collecting samples of historical material all over the world. Are film archives open to and prepared for researchers that do not just want to look at films, but actually want to study the materials?

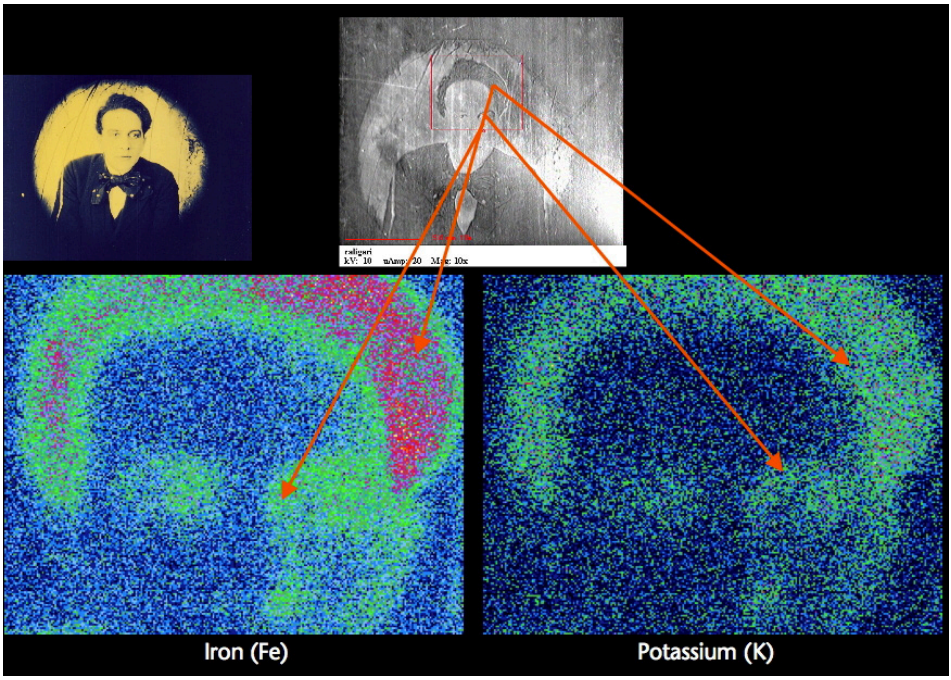
At the beginning this was much more difficult. Of course every archive has its own policies and rules how they grant access to researchers. Some of them were early on very

open and supportive, others are rather skeptical — I refrain from mentioning individual ones. Often it depended on personal relationships. After I had captured all the available historical nitrate prints of Das Cabinet des Dr. Caligari for our analysis of their color schemes (in collaboration with Anke Wilkening from the Murnau Foundation and in collaboration with the staff of L'Immagine ritrovata in Bologna),[11] many doors to archives started to open. The Caligari prints were so rare and some of them were in such a fragile condition that I was able to prove that my approach did not do any harm to the historical film material. Of course, I always respect the policies of each individual archive. Meanwhile many archives have started to see my research as mutually interesting and they understand it as collaboration. While they give me access to their material, I provide high-quality images and increasingly I give talks to interested staff members in order to provide insights into the results of my research. Many archives also understand that I do a lot of PR for their collections, because I showcase them on the *Timeline of Historical Film Colors*



Documentation of splices in the five surviving tinted and toned prints of *Das Cabinet des Dr. Caligari*.
© Friedrich-Wilhelm-Murnau-Foundation. Photographs by Barbara Flueckiger.

11) Barbara Flueckiger (2015): Color Analysis for the Digital Restoration of *Das Cabinet des Dr. Caligari*. In: *The Moving Image*. Volume 15, Number 1, Spring 2015, pp. 22–43.



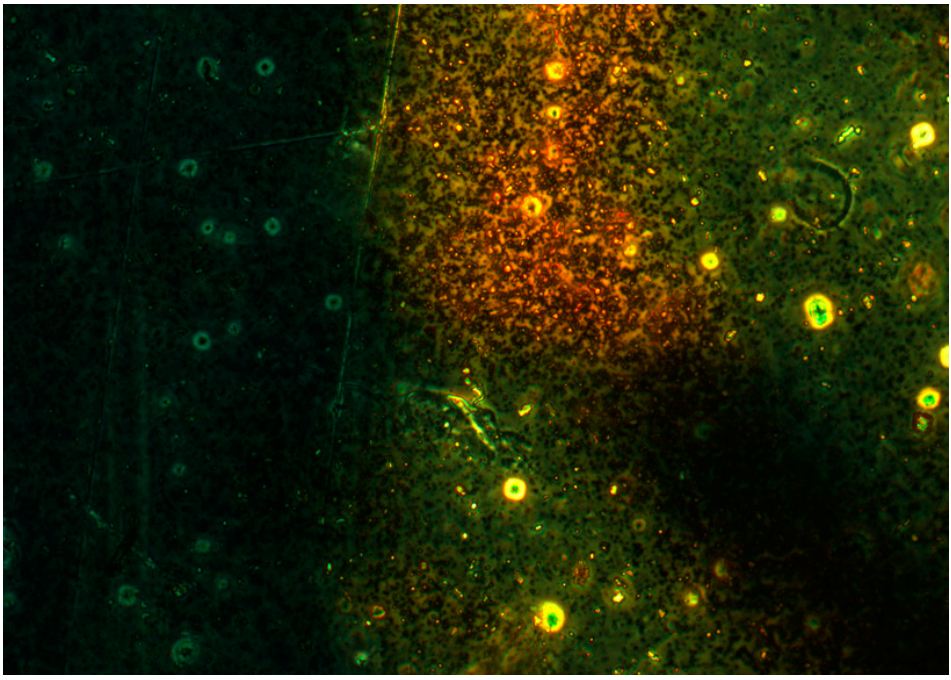
X-ray fluorescence by Beat Aeschlimann, ETH Zurich, Department of Chemistry and Applied Biosciences, Laboratory of Inorganic Chemistry

and I do a lot of communication via social media, on my Blog,[12] on Facebook[13] and Twitter,[14] where I also have several groups for academics and film lovers.

For a film archivist, the digitization changes a lot — archiving digital is altogether a different discipline than archiving analog films. It also brings questions that were not asked before (as you show in your NECSUS *article "Material properties of historical film in the digital age").*[15] *According to you, what are these questions and why should we be interested in answering them?*

One of the biggest misunderstandings results from the concept of digitization as preservation. Digitization — as we know it today — is only a reading of a certain film material under specific conditions. At best, it renders the appearance of a historical film based on deep research into its history and its aesthetics. Every digitization captures only some aspects of the analog film material but it does not reproduce the artwork in its integrity.[16]

12) Barbara Flueckiger's blog on film colors: <http://www.filmcolors.org>, [accessed 10 July 2015].
13) See for instance the Filmwissenschaft / Film Studies group on Facebook: <https://www.facebook.com/groups/175716329122592/>, [accessed 10 July 2015].
14) Barbara Flueckiger's Twitter: <https://twitter.com/flueko>, [accessed 10 July 2015].
15) Barbara Flueckiger, Material properties of historical film in the digital age. *NECSUS. European Journal of Media Studies*, Autumn 2012. Online: <http://www.necsus-ejms.org/materiál-properties-of-historical-film-in-the-digital-age/>, [accessed 8 July 2015].
16) Ibid.



Magnification, 20x. Credit: photomicrograph by Silvana Konermann.

Most scanning devices cut off important information such as edge codes and other metadata present on the non-image areas of a filmstrip. Furthermore, films are three-dimensional objects. They consist of several layers: the support, emulsion(s), probably filters as in some additive processes, or layers of individual dyes. Scanning extracts only color information. Thus, we should be aware that scanning is in essence a reduction of a wealth of information to a set of binary data that describe a film along the three color channels red, green and blue in a certain dynamic range and at a certain spatial resolution. Scanning is also a black-box operation. We don't know exactly what the scanners do, because the scanner manufacturers keep essential information secret. Usually we don't know the properties of the illumination, we don't know the properties of the sensor, and we don't know what kind of post-processing is applied to the captured data.

In addition, long-term storage is a largely unresolved topic. Current approaches suggest regular migration every two to three years, but no one knows how it will be possible to keep these migration processes in tune with future technology. How can we safeguard the long-term survival of all the information? How can we come up with a digitization protocol that is open to future applications, standards and formats? I'm sure that it is only a matter of time until a viable solution will be found. But it is not there yet.

Furthermore, as I have mentioned with regard to developing DIASTOR, we need to keep the knowledge about film alive. This includes the people who have the experience to work with analog film and this includes the facilities with all the extra machines necessary for processing film. In fact, an experienced staff and the machines have to be understood as a kind of culturally-grown biotope. Only someone with the knowledge about photo-

Compositing in *300* (USA 2006, Zack Snyder)

chemical processing and all the different film stocks used is able to understand the minute detail involved in the process.

In the very same article, you wrote that "there is no such thing as the *digital image, only a variety thereof." Could you elaborate on that?*

Digital images can be produced in a variety of ways. There are at least six different types of digital images, starting with digital photography or cinematography, scanning of an analog image, painting, image-processing, computer-generated imagery, and compositing. As I have largely investigated and discussed in my book *Visual Effects*, each of these varieties have different epistemological roots, they follow different modes of representation and they are used in different pragmatic frameworks. When we discuss digital images, we should be very precise what we are talking about. Most of the ethical debate about forgery in digital images addresses implicitly image processing and compositing of images in a documentary framework, but they never make their limited field of investigation clear and they do not reflect on their boundaries. Instead they posit "the digital image" as a fundamentally problematic phenomenon.

One of your projects concentrated on emotional impact of different recording technologies (analog and digital) on audiences. Could you summarize your results, or highlight the ones you find most interesting?

From 2012 to 2014 we were working on an interdisciplinary research project, directed by the Zurich University of the Arts, and in collaboration with media psychologists from

Video: https://player.vimeo.com/video/84974542
Screening and comparison of three different versions, produced in the framework of the Swiss research project Analog vs. Digital. The Emotional Impact of Film Recording Processes on the Audience. Main applicant and project leader: Prof. Christian Iseli, Institute of the Performing Arts and Film, ZHdK

the University of Berne.[17] Three short films were shot simultaneously on a digital and an analog camera, via a mirror rig that is usually applied for stereoscopic films. Three versions were then shown to audiences in the cinema, a digital one, an analog one, and a digital one with analog artifacts such as grain added in post-processing. In an additional screening all these versions were projected on an analog, mechanical film projector.

Research findings reveal that the transformation from analog to digital recording formats does not impair an audience's emotional cinema experience. As soon as an audience becomes engaged emotionally with a story, no significant differences between the original analog and digital material can be traced down. By contrast, the comparison of projection types revealed different results. In test screenings involving a smaller audience, mechanical 35mm projection resulted in significantly higher emotional involvement than digital projection.

However one of the most interesting findings from my perspective was a significantly higher rate by which test subjects recalled random items present in the digital pictures, such as what kind of color the stockings were that one of the characters was wearing. This result suggests different pathways of processing, as discussed in the *Elaboration Likelihood*

17) English annotation of the project: <http://www.research-projects.uzh.ch/p17041.htm/>, [accessed 10 July 2015].

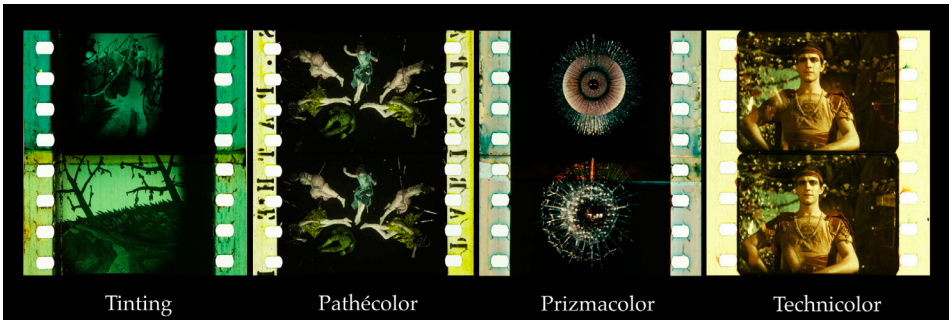
Model introduced in 1986 by Richard Petty and John T. Cacioppo, i.e. a more cognitively controlled central processing.[18)]

You not only research technologies being used in cinema, but you also use them to present your findings. Your Timeline of Historical Film Colors *is a unique resource for anyone studying film color, and is available on-line. Why did you choose this form of presentation?*

As briefly mentioned above, I noted that there is a wealth of information about film colors published, but they are hardly available for researchers, archivists or other persons interested in the topic. The interactive web platform not only allows me to collect and publish these resources, but also adds to the aesthetic dimension of film colors by presenting photographs captured from historical films in archives and other pictures available. An online resource allows you to continually adjust it and develop it further. It would never be possible to publish several thousand images in a printed publication. The web-platform also engages guest contributors to add texts and images directly.

Until now this comprehensive resource is freely available to everyone. This poses a major problem to me, because it is very difficult to continually sustain such a project financially. There are no funding schemes available yet. Initially I was able to raise more than 10'000 USD with a crowd-funding campaign. Doubling this amount from my private means enabled me to finance the professional development of the web-interface. Both the Swiss National Science Foundation and the University of Zurich contributed additional funding. Since then, I had to invest a huge amount of money from my private savings. Very recently I wrote many applications for funding by foundations, but they were all turned down. On the long run I have to find a solution for this problem.

But the project is widely acclaimed and it is also widely used by film scholars, archivists and a general audience. So far visitors from more than 160 countries have accessed the *Timeline of Historical Film Colors*. The number of visitors has doubled with the new starting page that was implemented with a classification system a year ago. Frankly, I enjoy this project every day, and I am truly overwhelmed by its success. When I started it, I would never have imagined that this project would develop so nicely and receive such a high level of attention.



A variety of early film colors. Photographs by Barbara Flueckiger.

18) Richard E. Petty – John T. Cacioppo, *Elaboration Likelihood Model. Central and Peripheral Routes to Attitude Change*. New York: Springer 1986.

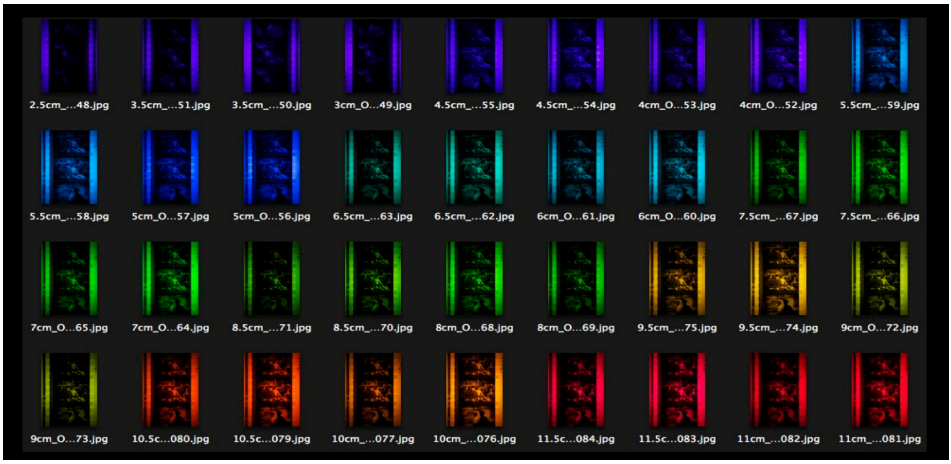
What is your view on academic publishing and the way it is headed now?

Right now we have a disequilibrium between the power of publishing houses with top-rated journals and the author's rights. Authors should gather and found their own online publications with open access. Instead of libraries and universities paying enormous fees to these publishing houses, they could then support the author's publishing activities directly. This would lead to much more open access and a better distribution of knowledge, while at the same time empowering the authors who then could keep their rights on their own publications.

Social media are a huge benefit for spreading knowledge in a grassroots fashion, i.e. from the bottom up, by the users and authors themselves. If you don't have a budget to employ a PR department you can do your own PR and reach interested groups and individuals globally. I've been using social media to connect and exchange ideas from a very early stage, when very few people of my generation were present there. This has allowed me to gather immediate knowledge about their functions and limitations. If you only publish postings about your achievements and your publications, this will become very boring for your circles. You have to keep the benefit for your audience in mind to produce a successful stream. In summary, however, it is crucial to be part of groups with whom you share common interests. For instance my film studies group works really well, but it requires constant curating to keep out unwanted members and to delete spam and postings that don't comply with the aim of the group. To be successful, a group needs to gather a critical mass of users, at least a thousand. If the group is too small it will not produce the necessary momentum to keep users' activities constantly alive.

Since this issue of Iluminace *is concentrated on digitization and archives, what would you say is the most important topic in this domain today?*

Both digitization/restoration and long-term storage. We need a more scientifically based approach to digitization and restoration. Too many restorations aim at enhancing the films, instead of respecting their historical integrity. The most basic rules of restoration ethics — transparency, documentation, reversibility — are violated constantly. When we see a restoration, we most often don't know from which film element — from which source — it was taken, we don't know by what process it was scanned and restored and the raw scan is not archived properly. This concerns also DVDs and Blu-rays. New editions often refer to new restorations, but it would be crucial to have access to the history of this restoration and to receive information about the digitization process. As long as we don't know anything about the background of a DVD or Blu-ray edition, these media remain a questionable source for film scholars and their analyses. In DIASTOR we have elaborated a non-destructive and scalable approach that is based on a thorough material analysis. The colorimetric and physical measurements guide the decisions for scanning and restoration, thus reducing subjective interpretations. In addition to the scientific measurements, it is crucial to collect as much information about a certain color aesthetics as possible by investigating a large group of films made with a process at a certain period, for example early Agfacolor from the 1940s. The systematic investigation of the connection between color technology and aesthetics will be the topic of my ERC Advanced Grant project "FilmColors" where we will investigate large groups of films with computer-assisted tools.



A statistical method to analyse the principal components in chromogenic stock. Executed by Giorgio Trumpy and Barbara Flueckiger in the framework of DIASTOR. Photographs by Barbara Flueckiger

Long-term storage is the second major unresolved problem. Even if archives have a robot library that delivers regular migrations of digital elements we still do not know how the results of these processes will look in twenty or more years from now. To be robust on a global scale and for many decades we would need a universal standard that keeps all information in place without the need for migration. However it is very hard to develop such a standard and to spread it world-wide. There are many approaches out there, such as punching the binary code into metal bands or store it on analog film, either as analog image or as digital code, but none of these approaches has been adopted by a majority of archives. Most of the archives struggle with a huge variety of digital formats, and even DCPs are accepted for storage, despite the fact that DCPs may not be readable within a few years and that they contain the information in a compressed format, whereas the information should be uncompressed to allow for later adjustments to new standards such as higher frame-rates, high dynamic range imaging, wider gamuts.

What would you say is the place of a film archive in the world of digital cinema? What should the archives aim for and concentrate on?

Preservation remains the most important task of film archives. However it would also be great to have digitization programs which give access to the precious gems that lie in the vaults. This starts with an online catalogue that lists in clever manner all the films present in an archive. I am well aware that there are legal problems associated with publishing an online catalogue. But the BFI has managed to implement such a catalogue, and it facilitates the work of researchers very much. Now I can do a research at home to figure out which prints I would like to investigate.

On top of preservation and online catalogue, access would be great, in order to provide the films digitized for inspection at home and to present them to a larger audience. However, this requires a huge amount of curatorial work, because films shown on web-

platforms should be digitized in a convincing manner and they should also be contextualized as outlined above with regard to restoration ethics.

In conclusion, in DIASTOR we have started to understand that politics are the most crucial factor for the successful transition from analog archives to hybrid ones that combine analog and digital preservation with programs for access. So far, this transition has been understood mainly as a technical one, but this notion is problematic in many respects. Technical solutions have to be contextualized within archival policies and with respect to film historical knowledge. Sometimes, I am quite disturbed to see that archives simply outsource the digitization of their holdings to a technical facility that lacks all the knowledge necessary for the complex task to translate analog films into the digital domain. This is not a simple question of equipment — even the best scanners have their drawbacks and limitations — it is in contrast a matter of profound knowledge of historical materials and aesthetics which are crucial in this process. Finally, the huge task archives are confronted with in this period of transition requires corresponding financial means and a corresponding environment consisting of experienced and well-educated staffs and all the necessary technical resources. If you only have the budget, but not the necessary environment you will not be able to achieve convincing and sustainable results.